

Exploring Genetic Information with Ease: The Linkout Plugin for JBrowse 2

Chi-Hsien Chang^{1§}, Szu-Ping Chen², Monica Poelchau^{3§}, Christopher Childers^{3§}

¹Department of Electrical Engineering, National Taiwan University

²Institute of Agronomy, National Taiwan University

³USDA, Agricultural Research Service, National Agricultural Library

§To whom correspondence should be addressed: salimachchang@gmail.com; monica.poelchau@usda.gov; christopher.childers2@usda.gov

Abstract

JBrowse 2 is a next-generation genome browser that can be run as a web or desktop application. We describe a new plugin, the Linkout Plugin, that enables users to link features to external databases based on their IDs and the remote URLs on JBrowse 2 desktop or web. As a result, genome analysis time and effort are reduced, enabling researchers to gain insights more quickly. The Linkout Plugin fills a common need scientists have: looking for more information on a gene. Overall, the Linkout Plugin is a valuable and practical addition to the JBrowse functionality.

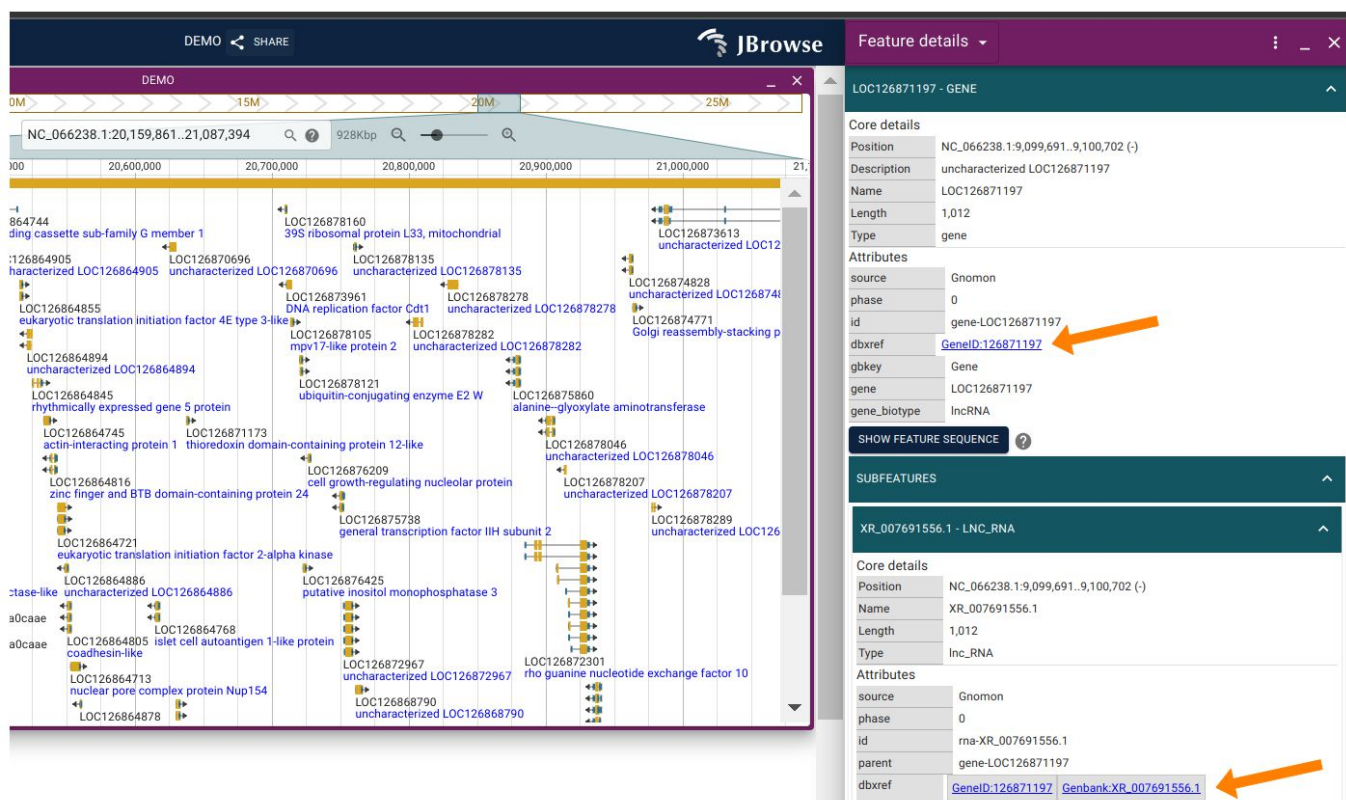


Figure 1. The Linkout Plugin for JBrowse 2:

The Linkout Plugin is able to automatically add linkouts to the National Center for Biotechnology Information (NCBI) feature page if a feature has NCBI IDs on the JBrowse 2 desktop or web. Users can click the “GeneID:126871197” or “Genbank:XR_007691556.1” cross-references on the right-hand side of the dbxref section.

Description

JBrowse 2 is a next-generation genome browser that can be run as a web or desktop application. Genome browsers serve as essential tools for efficient genome analysis. They enable researchers to visualize and explore genetic data while facilitating

data retrieval and analysis. However, manual input of URLs to link out to related resources on feature pages can be time-consuming and inefficient. This led to the need for a tool that simplifies the process and improves user convenience.

We developed a plugin that allows users to easily configure hyperlinks to cross-references in the JBrowse data. Based on user-defined preferences, the Linkout Plugin automatically generates URLs in the JBrowse 2 feature details panel, which can point to external resources, such as National Center for Biotechnology Information (NCBI) or HUGO Gene Nomenclature Committee (HGNC) gene and nucleotide pages. Figure 1 shows adding link outs to the NCBI feature page if a feature has NCBI IDs on JBrowse 2 desktop or web. Once users click on "GeneID:126871197" or "Genbank:XR_007691556.1" in the dbxref on the right, the plugin will direct to the corresponding websites: <https://www.ncbi.nlm.nih.gov/gene/126871197> or https://www.ncbi.nlm.nih.gov/nuccore/XR_007691556.1. Users can easily configure hyperlinks to cross-references in the JBrowse data by simply installing the Linkout Plugin from the plugin store and inputting URL information in the Settings. A demo video is available for users to understand how to use the plugin: [DEMO video](#).

With the Linkout Plugin, researchers can easily define where the generated URLs combined with the given gene IDs link to obtain genetic information. For example, researchers can define that linkouts to NCBI's feature page should be added automatically if a feature has NCBI or HGNC IDs within JBrowse 2. This plugin provides a direct connection to the external records, removing the need for manual searching and potential human error. This functionality reduces the time and effort involved in genome analysis, allowing researchers to focus on their analysis and gain insights more quickly. The Linkout Plugin fills a common need scientists have: looking for more information on a gene. Coupled with the simple configuration, this is a valuable new addition to JBrowse functionality.

The DOI of the Linkout Plugin is [10.5281/zenodo.8177361](https://doi.org/10.5281/zenodo.8177361). For user instructions, please refer to the Github tutorial at: <https://github.com/NAL-i5K/jbrowse-plugin-linkout>. Users can also obtain Linkout Plugin configuration in the Plugin Store at: https://jbrowse.org/jb2/plugin_store.

Acknowledgements: Thanks to Colin Diesh (<https://github.com/cmdcolin>) for the assistance provided during the development of the Linkout Plugin. This work was supported by the U.S. Department of Agriculture, Agricultural Research Service. Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U.S. Department of Agriculture. The U.S. Department of Agriculture prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Extended Data

Description: The demo vedio for the Linkout Plugin. Resource Type: Audiovisual. File: [DEMO Linkout Plugin.mp4](#). DOI: [10.22002/tg9a6-khw14](https://doi.org/10.22002/tg9a6-khw14)

References

Diesh, Colin, Stevens, Garrett J., Xie, Peter, De Jesus Martinez, Teresa, Hershberg, Elliot A., Leung, Angel, Guo, Emma, Dider, Shihab, Zhang, Junjun, Bridge, Caroline, Hogue, Gregory, Duncan, Andrew, Morgan, Matthew, Flores, Tia, Bimber, Benjamin N., Haw, Robin, Cain, Scott, Buels, Robert M., Stein, Lincoln D., Holmes, Ian H. 2023. JBrowse 2: a modular genome browser with views of synteny and structural variation. . 24: 74. DOI: [10.1186/s13059-023-02914-z](https://doi.org/10.1186/s13059-023-02914-z)

Funding: This work was funded by non-assistance cooperative agreement #58-8260-8-002 between the USDA-ARS National Agricultural Library and the National Taiwan University.

Author Contributions: Chi-Hsien Chang: software, methodology, visualization, investigation, writing - original draft, resources. Szu-Ping Chen: validation, investigation, writing - review editing, resources. Monica Poelchau: supervision, project administration, methodology, conceptualization, writing - review editing, resources. Christopher Childers: supervision, project administration, methodology, conceptualization, software, writing - review editing, resources.

Reviewed By: Scott Cain

8/19/2023 - Open Access

History: **Received** June 24, 2023 **Revision Received** July 25, 2023 **Accepted** August 17, 2023 **Published Online** August 19, 2023 **Indexed** September 2, 2023

Copyright: © 2023 by the authors. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Citation: Chang, CH; Chen, SP; Poelchau, M; Childers, C (2023). Exploring Genetic Information with Ease: The Linkout Plugin for JBrowse 2. microPublication Biology. [10.17912/micropub.biology.000906](https://doi.org/10.17912/micropub.biology.000906)